

WHAT IS CLAIMED IS:

1. A semiconductor device comprising:

5 a semiconductor substrate including plural trenches on a surface;

first and second insulators placed in the trenches respectively, and upper portions of side faces of said first and second insulators are higher than the surface of said substrate;

10 a third insulation film disposed on the surface of said substrate, one end of said third insulation film contacts with said first insulator, and the other end of said third insulation film contacts with said second insulator;

15 a first conductor disposed on a surface of said third insulation film, one end face of said first conductor contacts with said first insulator, and the other end face of said first conductor contacts with said second insulator;

a second conductor disposed at a vicinity of the one end face of said first conductor;

20 a third conductor disposed at a vicinity of the other end face of said first conductor;

a fourth insulation film contacting with a first side face of said second conductor and a second side face of said third conductor and contacting with a top face of said first conductor; and

25 a fourth conductor disposed on said fourth insulation film.

30 2. The semiconductor device as claimed in claim 1, wherein a second side face of said second conductor contacts with said first insulation film, and a first side face of said third conductor contacts with said second insulator.

35 3. The semiconductor device as claimed in claim 1, wherein a plurality of said first insulators are disposed in a longitudinal direction in parallel with one another, and a plurality of said fourth conductors are disposed in a transverse direction in parallel with one another.

4. The semiconductor device as claimed in claim 1, wherein said

second conductor electrically connects to said first conductor, and said third conductor electrically connects to said first conductor.

5 5. The semiconductor device as claimed in claim 1, wherein a width of said second and third conductors is decreased toward a stacked direction.

6. The semiconductor device as claimed in claim 1, wherein a bottom face of said fourth conductor disposed over said first insulator is higher than a top face of said first conductor.

10 7. The semiconductor device as claimed in claim 2, wherein a maximum interval between the second side face of said second conductor and the first side face of said third conductor is larger than a distance between the one end face and the other end face of said first conductor, and a lower face of said second conductor
15 is lower than a top face of said first conductor.

8. The semiconductor device as claimed in claim 2, wherein a maximum interval between the second side face of said second conductor and the first side face of said third conductor is smaller than a distance between the one end face and the other end face
20 of said first conductor.

9. The semiconductor device as claimed in claim 1, wherein an interval between the second side face of said second conductor and the first side face of said third conductor is upwardly smaller.

10. The semiconductor device as claimed in claim 2, wherein said
25 fourth insulation film is disposed between the second side face of said second conductor and said fourth conductor.

11. The semiconductor device as claimed in claim 1, wherein said second insulator is larger in width than said first insulator, and a top face of said second insulator is higher than that of
30 said first insulator.

12. A semiconductor device comprising:

 a semiconductor substrate including plural trenches on a surface;

 first and second insulators placed in the trenches,
35 respectively, and top faces of said first and second insulators are higher than the surface of said substrate;

a third insulation film disposed on the surface of said substrate;

a first conductor disposed on a surface of said third insulation film;

5 a second conductor disposed on a surface of said first conductor, and a top face at an outer side of said second conductor is higher than a top face at an inner side of said second conductor;

a fourth insulation film contacting with the top face of the inner side of said second conductor; and

10 a fourth conductor disposed on said fourth insulation film.

13. The semiconductor device as claimed in claim 12, wherein a first side face of said second conductor contacts with said second insulator, and a second side face of said second conductor
15 contacts with said first insulation film.

14. The semiconductor device as claimed in claim 12, wherein a plurality of said first insulators are disposed in a longitudinal direction in parallel with one another, a plurality of said second insulators are disposed in the longitudinal direction in parallel
20 with one another, and a plurality of said fourth conductors are disposed in a transverse direction in parallel with one another.

15. The semiconductor device as claimed in claim 12, wherein said second conductor electrically connects to said first conductor.

25 16. The semiconductor device as claimed in claim 12, wherein a width at the outer side of said second conductor is decreased toward a stacked direction.

17. The semiconductor device as claimed in claim 12, wherein a bottom face of said fourth conductor disposed over said first
30 insulator is higher than a top face of said first conductor.

18. The semiconductor device as claimed in claim 13, wherein a maximum interval between the first side face and the second side face of said second conductor is larger than a width of said first conductor, and a lower face of said second conductor is
35 lower than a top face of said first conductor.

19. The semiconductor device as claimed in claim 13, wherein

a maximum interval between the first side face and the second side face of said second conductor is smaller than a width of said first conductor.

20. The semiconductor device as claimed in claim 13, wherein
5 an interval between the first side face and the second side face of said second conductor is upwardly smaller.

21. The semiconductor device as claimed in claim 13, wherein said fourth insulation film is disposed between the second side face of said second conductor and said fourth conductor.

10 22. The semiconductor device as claimed in claim 12, wherein said second insulator is larger in width than said first insulator, and a top face of said second insulator is higher than that of said first insulator.

23. A manufacturing method of a nonvolatile memory comprising:
15 sequentially forming a first insulation film, a first floating gate film, and a cap on a semiconductor substrate;
etching the first insulation film, the first floating gate film, and the cap on the same pattern;
filling a second insulation film in the pattern;
20 removing the cap; and
forming a second floating gate film on a side face of the second insulation film and a top face of the first floating gate film, and a top face at an outer side of the second floating gate is higher than a top face at an inner side of the second
25 floating gate.

24. The manufacturing method of a nonvolatile memory as claimed in claim 23, wherein after said forming the second floating gate film, the second insulation film is etched.

25. The manufacturing method of a nonvolatile memory as claimed
30 in claim 23, wherein, in said forming the second floating gate film, the second floating gate film is disposed as one body on the first floating gate film.

26. The manufacturing method of a nonvolatile memory as claimed in claim 23, further comprising:
35 forming a fourth insulation film on the second floating gate film and on the second insulation film; and

forming a fourth conductor film on the fourth insulation film.